recent conclusions regarding the phenomena and origin of volcanic action by the selection of examples drawn from districts where these phenomena have been most carefully observed and recorded under the light of modern geological science."

An admirable feature of the work is the recognition of the principle that vulcanological problems may often be better attacked by the study of ancient and greatly denuded volcanoes, rather than by the examination of those in actual activity, or of such as have recently become extinct.

"*Encyclopédie scientifique des Aide-mémoire*":—
Résistance des matériaux. Par M. Duquesnay.
Étude expérimentale calorimétrique de la machine à vapeur. Par V. Dwelshauvers-Dery.
Air comprimé ou raréfié. Par Al. Gouilly.
(Paris: Gauthier-Villars, Georges Masson.)

THESE three little hand-books on their respective subjects are made by the separate publication of the respective articles of the "Encyclopédie scientifique"; it is intended that each subject is to appear in a separate volume at a rate of publication of thirty to forty a year.

There is no indication by numbering as to the order of appearance, so that probably these are the pioneer volumes.

The first volume, "La résistance des matériaux," gives a very clear and concise account of the practical side of Elasticity, so far as required by the engineer in the design of beams, columns, bridges, and retaining walls.

Prof. Dwelshauvers-Dery is well known for his theoretical and experimental researches on the Steam Engine, and his treatise may be considered as the application of the empirical laws of saturated vapours to the theoretical determination of the useful effect obtainable in the different forms of steam engine, simple or compound, with an attempt at the evaluation of the loss due to conduction. The results arrived at are checked by comparison with long-continued steam-engine trials carried out by Hirn, Donkin, Longridge, and the author himself.

The third volume, on "Air comprimé," may be supposed to carry out the same development of abstract Thermodynamics when the medium is supposed to behave as a perfect gas. In this case the mathematical laws, developed at the outset, are capable of more ready and immediate application; and the second half of the book gives a detailed account of the employment of air as the medium for the transmission of energy in its various industrial applications—for instance, as laid on in Paris compressed in mains, or as employed when rarefied in the Westinghouse brake.

A useful feature in these books is a page at the outset, in which the notation to be subsequently employed is carefully explained.

The Mechanical Equivalent of Heat is taken as 425 kilogrammetres, presumably at Paris; the mean of Prof. Rowland's experiments gives about 427 Baltimore kilogrammetres, or in absolute measure about 42 million ergs, or 4·2 joules.

The "Encyclopédie" is to be divided in interest between the *section de l'Ingénieur* and the *section du Biologiste;* the volumes promised in the first section, as in course of preparation, will constitute a valuable technical working library. G.

Chambers's Encyclopædia. New Edition. Vol. IX. (London and Edinburgh: W. and R. Chambers, 1892.)

THE new edition of this admirable Encyclopædia is now approaching completion, and in the present volume there is certainly no falling-off in the ability with which the work has hitherto been written and edited. On all important subjects represented by words between "Round" and "Swansea" there are articles summing up the latest results of research. An excellent article on round towers, by Dr. Joseph Anderson, is given on the first and second pages. This is a model of what such a paper ought to be. The author knows his subject thoroughly, and consequently understands where to draw the line between ascertained facts and the theories based upon them. Another well-arranged archæological contribution by Dr. Anderson is the paper on sculptured stones. Dr. John Murray writes with his usual lucidity on the sea and on sounding. The task of expounding the facts and laws relating to sound and to the spectrum has been intrusted to Prof. Knott, and the Rev. E. B. Kirk contributes the articles on the sun and the stars. Dr. Buchan is the author of a clear and interesting paper on storms. Other scientific articles which may be specially noted are those on the Silurian system, by Prof. James Geikie; on the skull, by Dr. D. Hepburn; on the snail and the slug, by Mr. T. D. A. Cockerell; on snakes and spiders, by Mr. J. A. Thomson; on the steam-engine, by Prof. A. B. W. Kennedy; and on the steam-hammer, by Prof. T. H. Beare. Among the geographical contributions are articles on Russia, by Prince Kropotkin; on Siam, by Mr. J. S. Black; on South Australia, by Mr. J. Bonwick; and on Spain, by the Rev. Wentworth Webster.

A Guide to Electric Lighting. By S. R. Bottone. (Whittaker and Co., London, 1892).

IN this work the author gives a general idea of the various methods of electric lighting, without entering into any of those technicalities which tend to confuse rather than enlighten the ordinary reader. Commencing with descriptions of the various batteries that are now employed, he discusses their particular advantages and disadvantages, adding also a table of their E.M.F., currents, and resistances.

The second chapter, which is devoted to the production of currents by means of the dynamo, will enable the reader to form some idea as to the selection of one of these machines for a given purpose, and to understand its general principles. Perhaps the chapter on electric lamps and accumulators will be found the most serviceable, for one is brought far more into contact with them than with dynamos themselves. The information here will enable anyone to set up a small installation for himself, while a very useful table shows the dimensions, capacities, weights, &c., of accumulators suitable for such work.

The remaining chapters deal with the descriptions of some of the smaller appliances necessary in connecting up the supplier of electricity, whether it be dynamo or accumulator, with motors or transformers, and last but not least with an excellent *résumé* of the cost of maintenance, showing the relative prices of gas and electricity as now regulated.

The book contains numerous illustrations, and as a thoroughly practical and handy work should be widely read.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

"The Grammar of Science."

To the vast majority of readers, chapter ix. of the "Grammar of Science" will probably seem to be simply a plea in favour of the doctrine of evolution in its purest form. We were not called upon to express any opinion as to the merits of this doctrine, nor did we. What struck us (and still strikes us) as fundamentally illogical, was the formulation of a theory, which, itself avowedly a mental product, proceeded to picture a universe devoid of sentient beings, or, in the phraseology of the "Grammar," a

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conceptual world evolving the perceptive faculty which creates it. An evolution theory which postulates spontaneous generation and human automatonism is natural to the materialist; and hence our contention that, in spite of the general character of the argument in the earlier chapters of the book, certain conclusions are distinctly materialistic.

Again, we are not of those who would bind down all time to Newton's views on matter, force, and motion. That never has been the position of those whom Prof. Pearson delights in nicknaming the Edinburgh school. Only we think a writer should be careful as to what he imputes to Newton. Thomson and Tait say, "We cannot do better, at all events in commencing, than follow Newton somewhat closely": and unless they have misrepresented the teaching of the "Principia," an attack on their version surely amounts to an attack on Newton. Indeed, Prof. Pearson fully realizes this himself, when, on p. 382, he accuses Newton of thinking of "force in the sense of mediæval metaphysics as a cause of change in motion." It was this statement we took exception to. Similarly, we cannot but look upon Prof. Pearson's obvious jeer at Maxwell's language as of the same gratuitous character.

"Matter is, as it were, the plaything of force"—this evidently Prof. Pearson regards as his trump card. Now these words—and note the "as it were"—occur in the discussion of Newton's laws of motion, and are obviously suggested by Newton's own anthropomorphic language. But they can give rise to no misapprehension in the mind of one who is reading Prof. Tait's "Properties of Matter" for profit. In the light of the introductory chapter there is really no room for other than wilful misrepresentation of Prof. Tait's position. Moreover, it is positively astonishing to find an author, who has no slender claims to the title of historian, confessing his ignorance of Prof. Tait's lecture on "Force," delivered before the British Association in 1876, and published in NATURE, vol. xiv. (see also "Recent Advances," third edition, and Maxwell's "Life," p. 646). That lecture was, we think, the first popular exposition of the subjectivity of force. The recognition of this truth was, of course, a natural consequence of the remarkable series of discoveries which brought home to the mind that energy was physically as objectively real as matter. We certainly did not need to go all the way to Berlin to learn it. C. G. K.

On the Line Spectra of the Elements.

I OBSERVE from Prof. Runge's last letter that on one point I was led into misinterpreting his meaning by his having used the letter *j* in his second formula on p. 100 (NATURE of June 2) in a sense different from the only definition that had been given of that symbol, viz. the jot of time—the time that light takes to advance one-tenth of a millimetre in the open æther. The period of time represented by *j* is as determinate as a day or hour. With it, Prof. Runge's equation represents one definite discontinuous motion along the sloping sides of the teeth of a particular saw, and this is what I understood by it. I perceive now that he intended *j* to be interpreted in a new sense, and meant the equation to represent uniform motion in a straight line to an *indefinite* distance.

If all that Prof. Runge wishes to point out is that motion along an orbit that extends to infinity must be either wholly incapable of being represented by a Fourier's series, or at least must contain a component of that kind, this is both true and obvious; and the instance he gives (which is, in fact, uniform motion to an unlimited distance along a straight line) is a case in point. But it should be added, no such component of the motion of an electric charge which does not yield to Fourier's theorem can produce any periodic disturbance in the æther: in other words, *it would not contribute anything to the spectrum*. Accordingly, any such part of the motion—for instance, the advance, in common with the rest of the solar system, of the electrons within the molecules of a gas on the earth, at the rate of eight miles a second, towards the constellation Hercules, which is the precise kind of motion that Prof. Runge adduces as an instance—has nothing whatever to do with the subject of my memoir, which is an investigation into the cause of double lines *in spectra*. It should further be added that unlimited motions of any kind have nothing to do with motions going on *within molecules*, to the investigation of which chapter iv. of my memoir is devoted, and that any discussion of them there would have been out of place.

Hence, to represent as a defect which vitiates my reasoning, as Prof. Runge does, that I have omitted in that chapter to refer to the motions which are not resolvable by Fourier's theorem, is, I submit, not legitimate criticism, especially as the matter, beside being irrelevant, is obvious; and I also submit that to say "A plausible suggestion about the movement of the molecules ought to explain more than one of the observed phenomena" (NATURE, April 28, p. 607) is not criticism at all. We must use the data furnished by our observation of nature to carry us as far as they will go in the interpretation of nature, and not refuse to employ them to that extent because they do not enable us to get further.

G. JOHNSTONE STONEY.

9 Palmerston Park, Dublin, July 2.

Range of the Sanderling in Winter.

As my little contribution to the *Records of the Australian Museum* has been honoured by a notice in NATURE (*suprà*, pp. 177–78), I must ask leave to qualify two statements therein made. Since I wrote it I have become aware that Dr. Finsch had a specimen of the Sanderling (*Calidris arenaria*) brought to him at Bonham Island, one of the Marshall Group, which lies within the tropics (*Ibis*, 1880, p. 331); and, after the publication of Mr. Everett's list of the birds of Borneo in 1889, that gentleman announced the occurrence of this species at Baram, on the north-east coast of that island (*Ibis*, 1890, p. 465). ALFRED NEWTON.

Magdalene College, Cambridge, June 25.

Immunity of the African Negro from Yellow Fever.

DR. CREIGHTON will find that on p. 51 of a report dated 1890, "On the Etiology and Prevention of Yellow Fever," Dr. George M. Sternberg (Lieut.-Colonel and Surgeon U.S. Army) makes the following statement:—

"It has been asserted that the negro race has a congenital immunity from yellow fever, but this is a mistake. The susceptibility of the negro is, however, much less than that of the white race. Amongst those attacked the mortality, as a rule, is small."

He will also find the subject discussed on pp. 166–67 of "A Contribution to the Natural History of Scarlatina," by Dr. D. Astley Gresswell (Clarendon Press, 1890). Dr. Gresswell writes thus:—

"The African negro of pure descent was supposed to be insusceptible to the virus of yellow fever and of malaria. It is said, however, that when these affections are prevailing in a virulent form the negro does become infected and manifest such infection. This would suggest that the almost complete immunity in the case of the negro has been acquired. Moreover, the fact that negroes of pure descent are more likely to manifest the symptoms of yellow fever on exposure to the poison after they have passed some years or some generations in more temperate latitudes, in which the disease is not indigenous, suggests that in order to maintain this degree of immunity it is necessary that the negro should continue to live in localities in which the virus exists; in other words, that the individual or the race should be repeatedly subjected to the virus. It may, in fact, be questioned how far, in regard to these diseases in man, susceptibility differs independently of protection acquired by previous subjection to the action of the virus or its products; though natural selection may (as certain facts indicate) have acted more directly. Indeed, it is quite possible that protection acquired by previous infection is much more frequently a cause for benignity or only partial susceptibility in the case of these and other infection-diseases than is generally allowed for."

I do not think I can with advantage add anything to these quotations. YOUR REVIEWER.

A Solar Halo.

IN connection with the heavy thunderstorms further south, possibly, there was here the most brilliant solar halo on the 29th which I have seen. The wind was easterly all the time, causing sea-fog-like clouds in the morning, which dissipated by degrees about 10, but I did not notice the halo before 10.45, nor after 3.30 or 4 o'clock. It was certainly gone at 5.

Though a complete halo at 11, it was far intenser above and below, the north-west and south-east octant especially. By 1 o'clock this had shifted to the north-east and south-west octants.

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